

What is claimed is:

1. An acoustic inkjet printing apparatus focusing acoustic waves generated by transducers and ejecting droplets of a printing liquid from a surface thereof by means of a sound pressure of the acoustic wave, the acoustic inkjet printing apparatus comprising:
 - a printing liquid containing chamber containing the printing liquid;
 - a piezoelectric element including a main transducer and at least one sub transducer located on at least one side of the main transducer, and generating the acoustic wave by receiving a signal; and
 - an acoustic focusing member focusing the acoustic wave generated by the piezoelectric element near the surface of the printing liquid, thereby ejecting the droplets of the printing liquid,the acoustic inkjet printing apparatus being capable of switching between a first ejection mode in which the droplets are ejected in a first direction perpendicular to a liquid surface in the printing liquid containing chamber and a second ejection mode in which the droplets are ejected at an angle to the first direction by applying or not applying a drive signal to the sub transducer in accordance with image printing data, while the drive signal is being applied to the main transducer of the piezoelectric element.
2. The apparatus according to claim 1, wherein the sub transducers are provided at both sides of the main transducer.
3. The apparatus according to claim 1, wherein the acoustic focusing member is either a concave lens spherical aberration of which has been corrected or a Fresnel lens.
4. The apparatus according to claim 1, further comprising a droplet recovery member provided so as to face toward the surface of the printing liquid, and having an opening, through which some of the ejected droplets pass, and a droplet recovery surface facing toward the surface of the printing liquid, the ejected droplets that do not pass through the opening hitting the droplet recovery surface, thereby directly or indirectly returning to the printing liquid containing chamber.
5. The apparatus according to claim 4, wherein the droplet recovery surface is located on at least one side of the opening of the droplet recovery member.

6. The apparatus according to claim 4, wherein the droplet recovery surfaces are located on both sides of the opening of the droplet recovery member.
7. The apparatus according to claim 4, wherein the droplet recovery surface serves as a surface which the droplets hit and along which the hit droplets flow in accordance with the force of gravity so as to be recovered.
8. The apparatus according to claim 1, further comprising a drive signal generating circuit generating the drive signal to be applied to the piezoelectric element.
9. The apparatus according to claim 8, wherein the drive signal generating circuit is capable of applying or not applying the drive signal to the sub transducer in accordance with at least the image printing data signal externally applied thereto, while the drive signal is being applied to the main transducer.
10. The apparatus according to claim 1, wherein centers of the main transducer and the acoustic focusing member are shifted from each other.
11. The apparatus according to claim 4, wherein a partition wall is provided inside the droplet recovery surface, the partition wall preventing the ejected droplet returning from the droplet recovery surface to the printing liquid containing chamber from hitting the ejected droplet flying out of the opening.
12. The apparatus according to claim 4, wherein the acoustic focusing member is provided in a manner to eject the droplets in a horizontal direction, and the droplet recovery surface is provided at least below the opening.
13. The apparatus according to claim 4, wherein the acoustic wave focusing member is provided in a manner to eject the droplets downward in a vertical direction, and the droplet recovery surface is provided so as to face upward on at least one side of the opening.
14. The apparatus according to claim 1, wherein centers of the main transducer and the acoustic focusing member coincide with each other, and the sub

transducer is provided at one side of the main transducer.

15. The apparatus according to claim 1, wherein a plurality of the sub transducers are provided on at least one side of the main transducer.

16. The apparatus according to claim 1, wherein the acoustic focusing member is provided in a such manner that the acoustic waves are emitted diagonally relative to a direction of the ejected droplets.

17. The apparatus according to claim 1, wherein the piezoelectric element generates an ultrasound wave.

18. An acoustic inkjet printing apparatus focusing acoustic waves generated by transducers and ejecting droplets of a printing liquid from a surface thereof by means of a sound pressure of the acoustic wave, the acoustic inkjet printing apparatus including a plurality of printing liquid ejecting units arranged in a matrix form, the units in adjacent lines being shifted from each other, each unit comprising:

a printing liquid containing chamber containing the printing liquid;

a piezoelectric element including a main transducer and at least one transducer located on at least one side of the main transducer, and generating the ultrasound wave by receiving a signal; and

an acoustic focusing member focusing the acoustic waves generated by the piezoelectric element near the surface of the printing liquid, thereby ejecting the droplets of the printing liquid,

the acoustic inkjet printing apparatus being capable of switching between a first ejection mode in which the droplets are ejected in a first direction perpendicular to a liquid surface in the printing liquid containing chamber and a second ejection mode in which the droplets are ejected at an angle to the first direction by applying or not applying a drive signal to the sub transducer in accordance with image printing data, while the drive signal is being applied to the main transducer of the piezoelectric element.

19. The apparatus according to claim 18, wherein the piezoelectric element generates an ultrasound wave.

20. A method of ejecting and recovering a printing liquid by focusing acoustic waves generated by a transducers, ejecting droplets of the printing liquid contained in a printing liquid containing chamber from a surface thereof by means of a sound pressure of the acoustic wave, and recovering the droplets, wherein

the droplets are ejected in a straight manner so as to pass through an opening of a droplet recovery member by applying or not applying a drive signal to a sub transducer located adjacent to a main transducer of a piezoelectric element in accordance with image printing data, and the droplets are ejected in a deflecting manner so as to hit a droplet recovery surface of the droplet recovery member by applying or not applying the drive signal to the sub transducer, while the drive signal is being applied to the main transducer.